Fig. 1

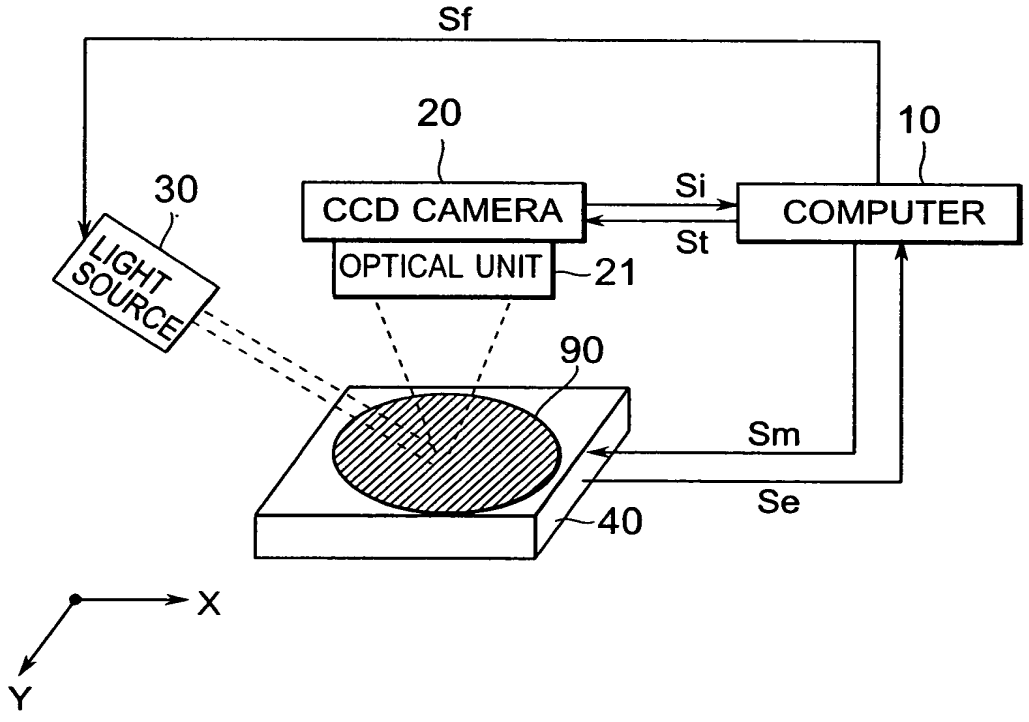
Sf
20
10
30
CCD CAMERA
Si
COMPUTER
St
LIGHT SOURCE
OPTICAL UNIT
21
90
Sm
Se
40
X
Y

Fig. 2

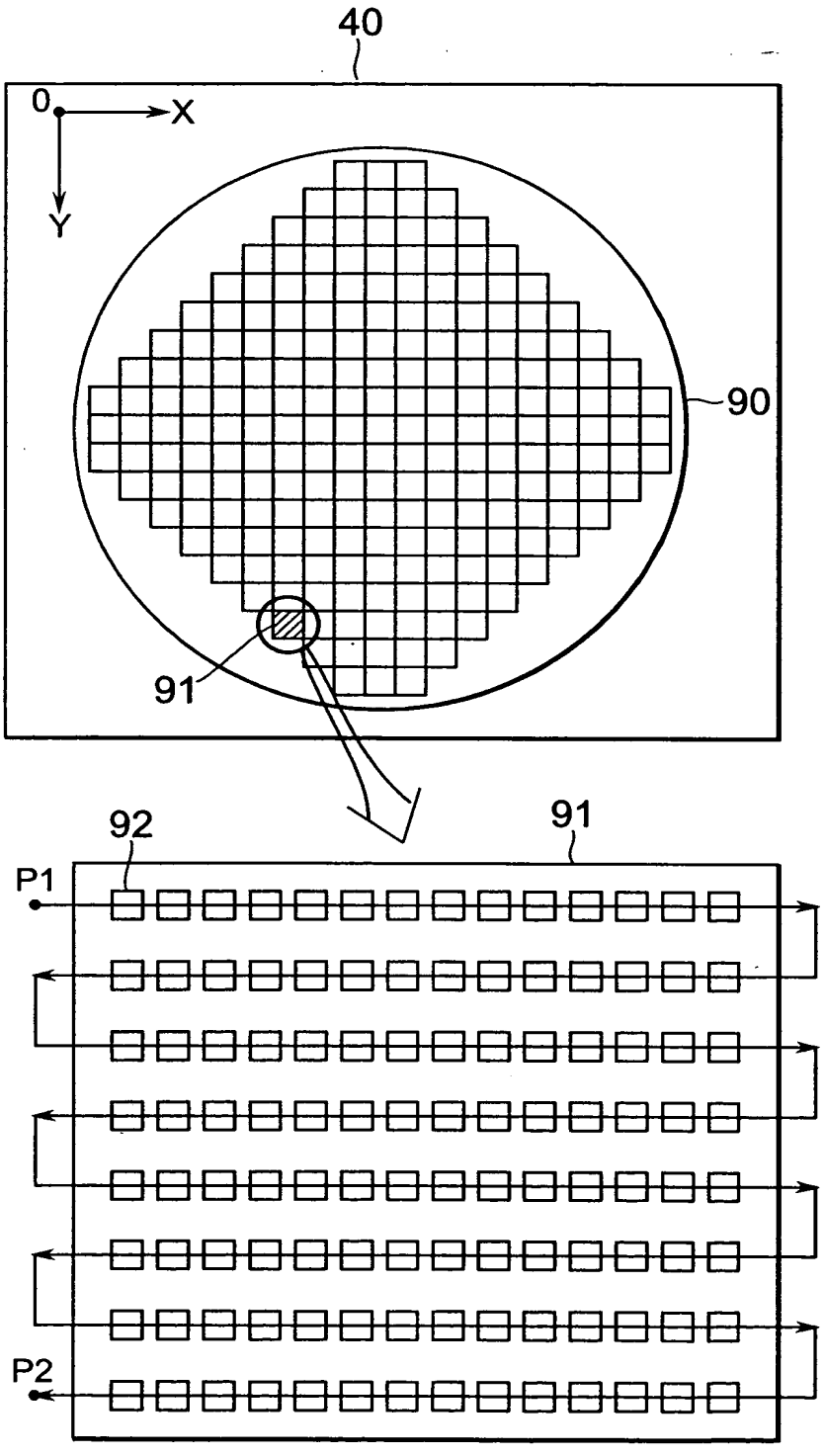

Fig. 3

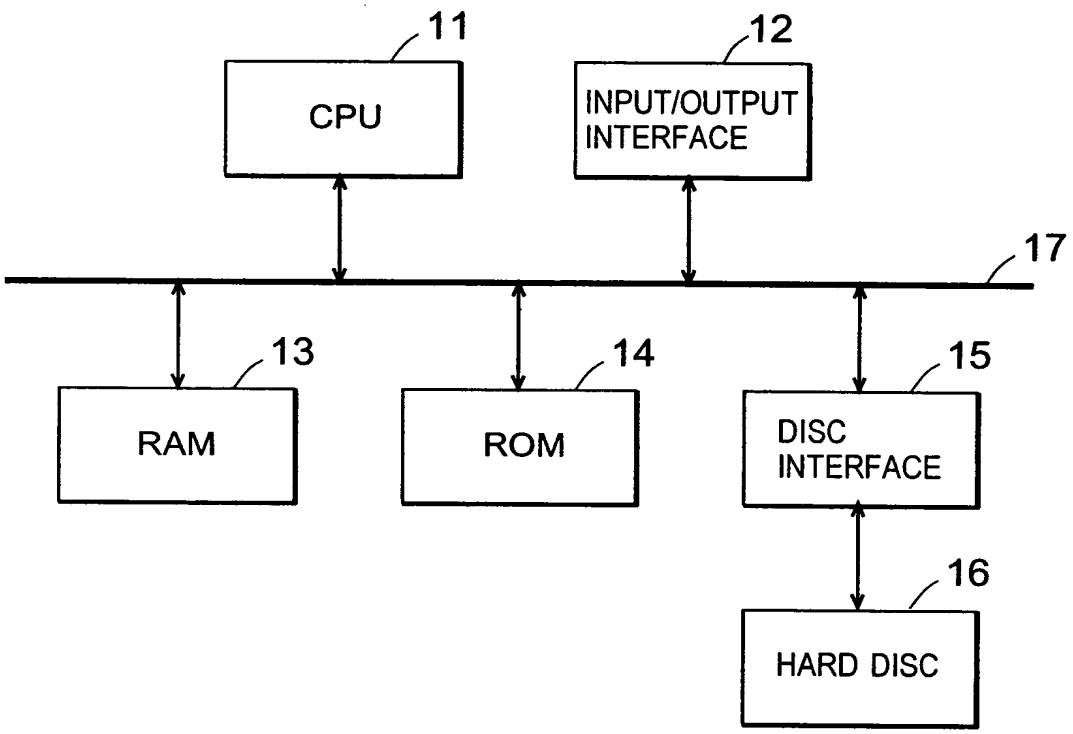
11
CPU
12
INPUT/OUTPUT
INTERFACE
17
13
RAM
14
ROM
15
DISC
INTERFACE
16
HARD DISC

Fig. 4

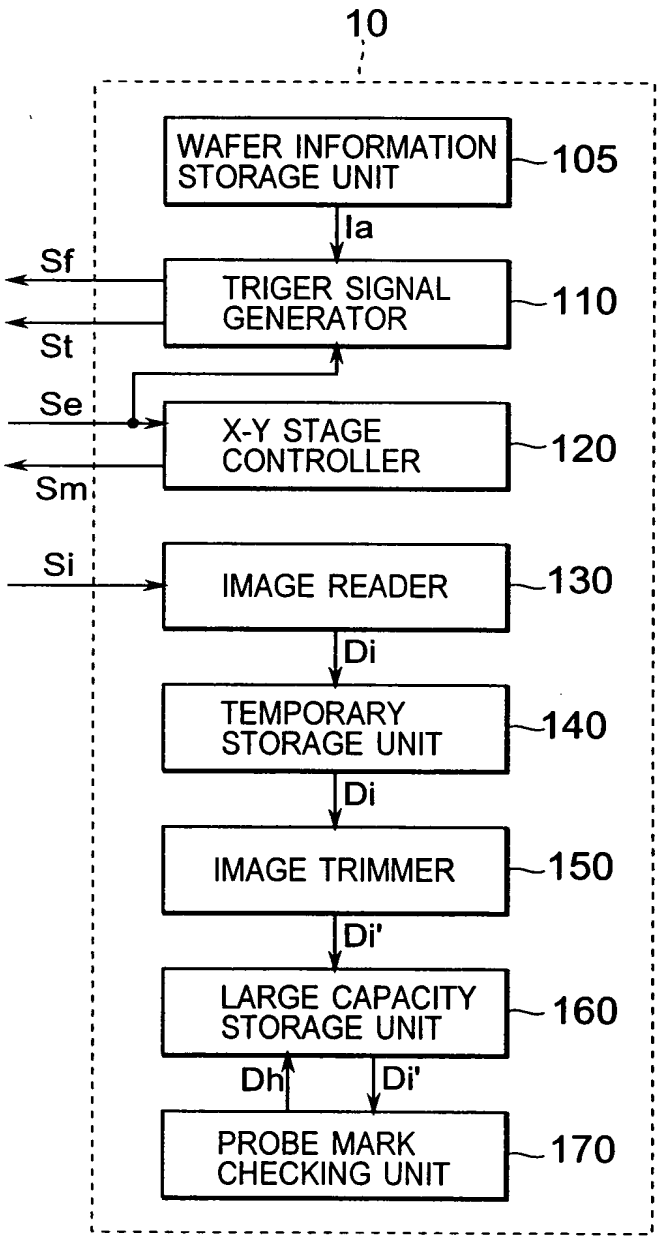
10
WAFER INFORMATION STORAGE UNIT
105
Ia
Sf
TRIGER SIGNAL GENERATOR
110
St
Se
X-Y STAGE CONTROLLER
120
Sm
Si
IMAGE READER
130
Di
TEMPORARY STORAGE UNIT
140
Di
IMAGE TRIMMER
150
Di'
LARGE CAPACITY STORAGE UNIT
160
Dh
Di'
PROBE MARK CHECKING UNIT
170

Fig. 5

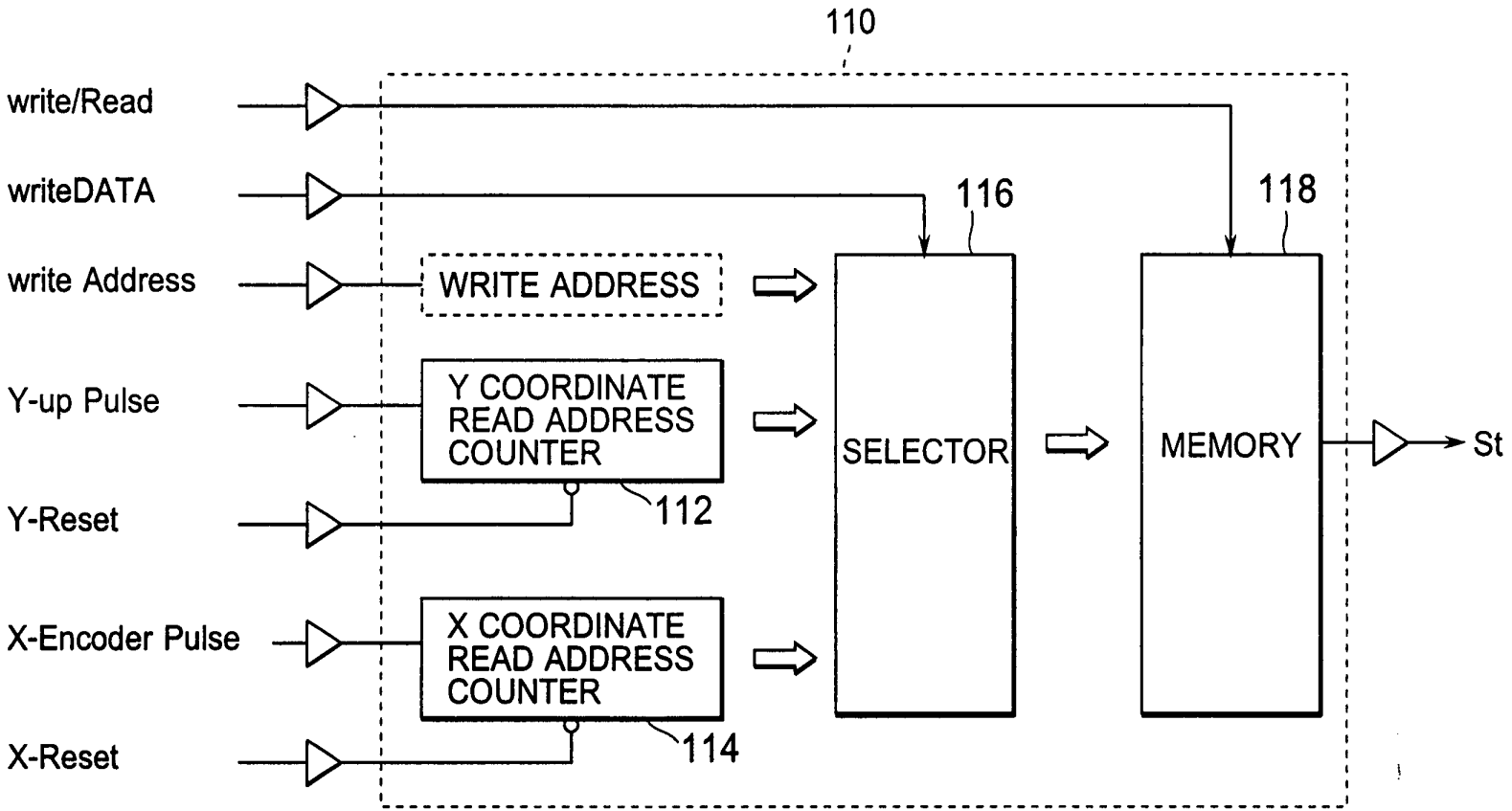
110
write/Read
writeDATA
write Address
Y-up Pulse
Y-Reset
X-Encoder Pulse
X-Reset
WRITE ADDRESS
Y COORDINATE READ ADDRESS COUNTER
112
X COORDINATE READ ADDRESS COUNTER
114
116
SELECTOR
118
MEMORY
St

Fig. 6

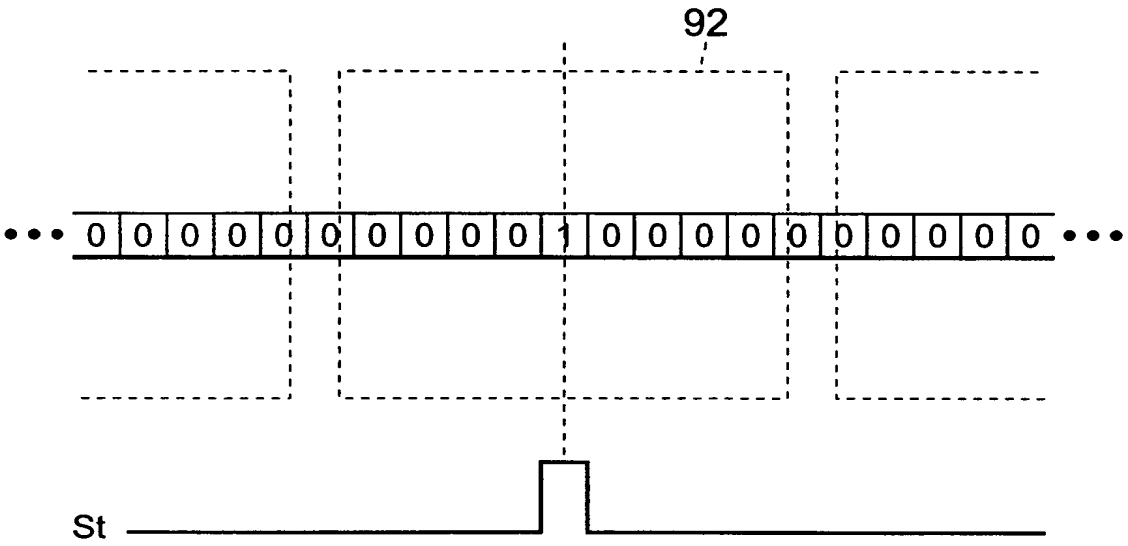

Fig. 7

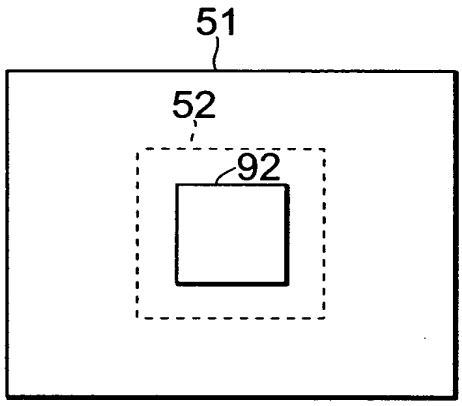

Fig. 8

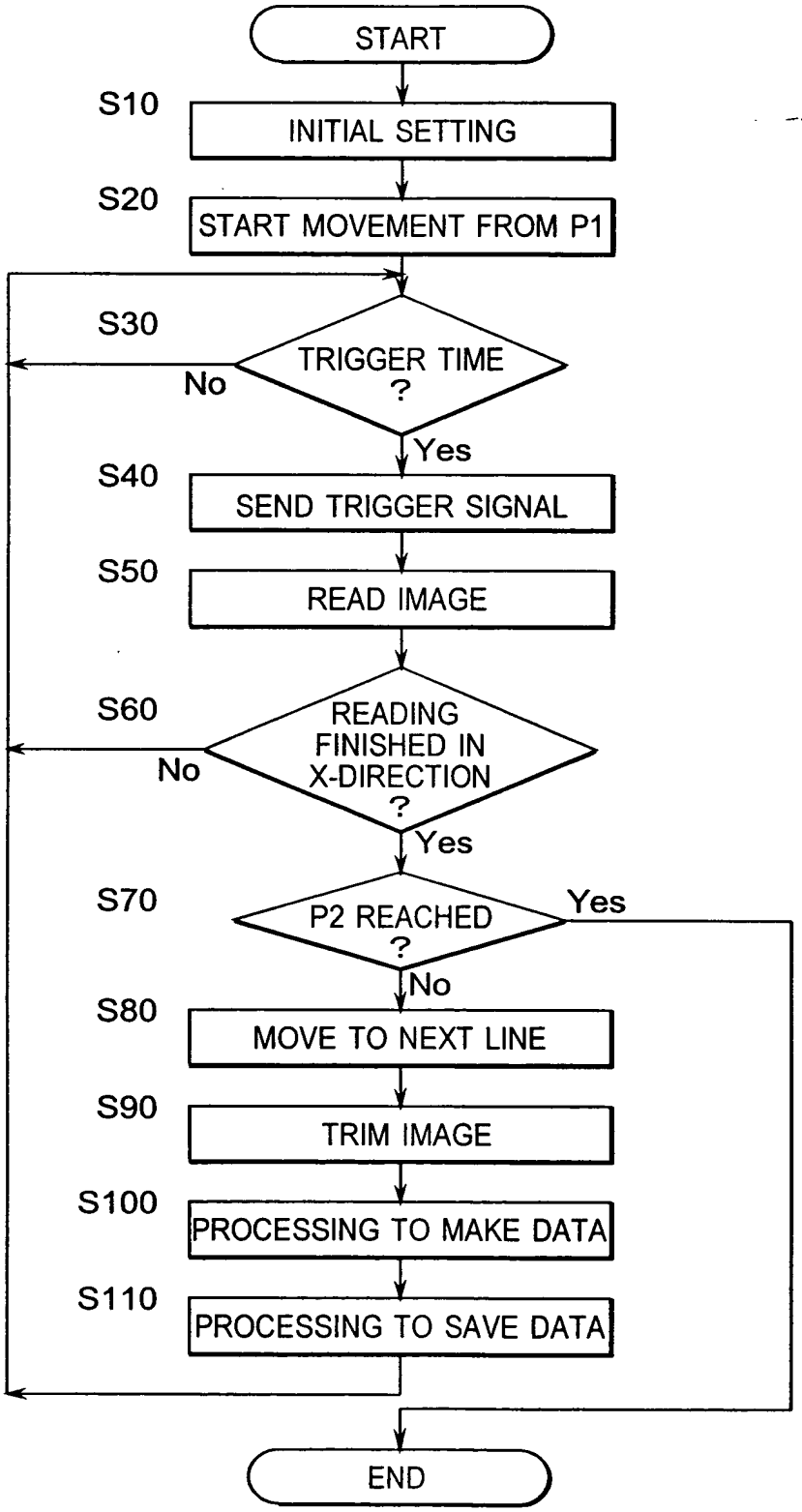
START
S10
INITIAL SETTING
S20
START MOVEMENT FROM P1
S30
TRIGGER TIME ?
No
Yes
S40
SEND TRIGGER SIGNAL
S50
READ IMAGE
S60
READING FINISHED IN X-DIRECTION ?
No
Yes
S70
P2 REACHED ?
Yes
No
S80
MOVE TO NEXT LINE
S90
TRIM IMAGE
S100
PROCESSING TO MAKE DATA
S110
PROCESSING TO SAVE DATA
END

Fig. 9

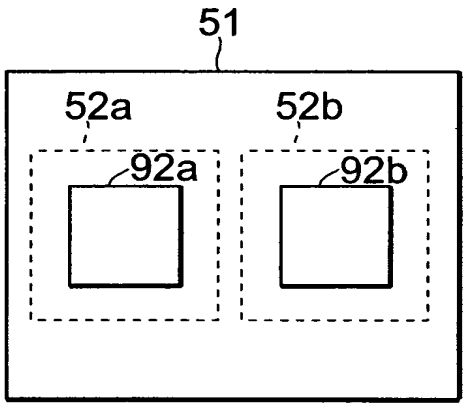

Fig. 10

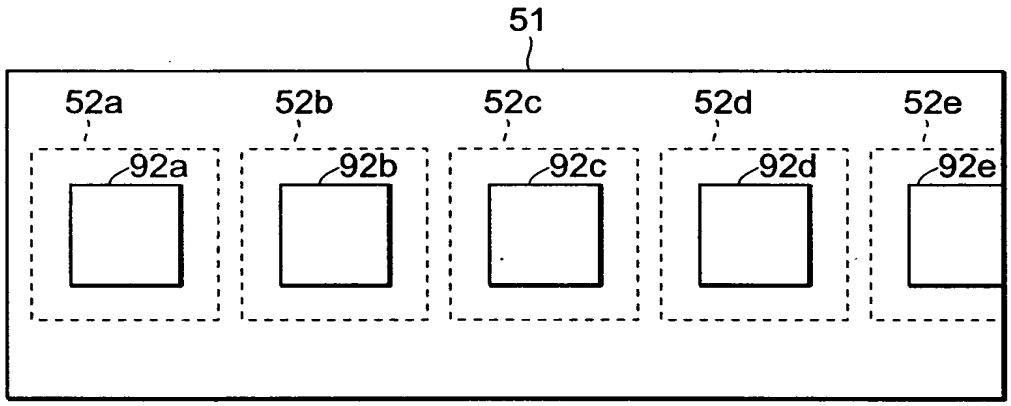

Fig. 11

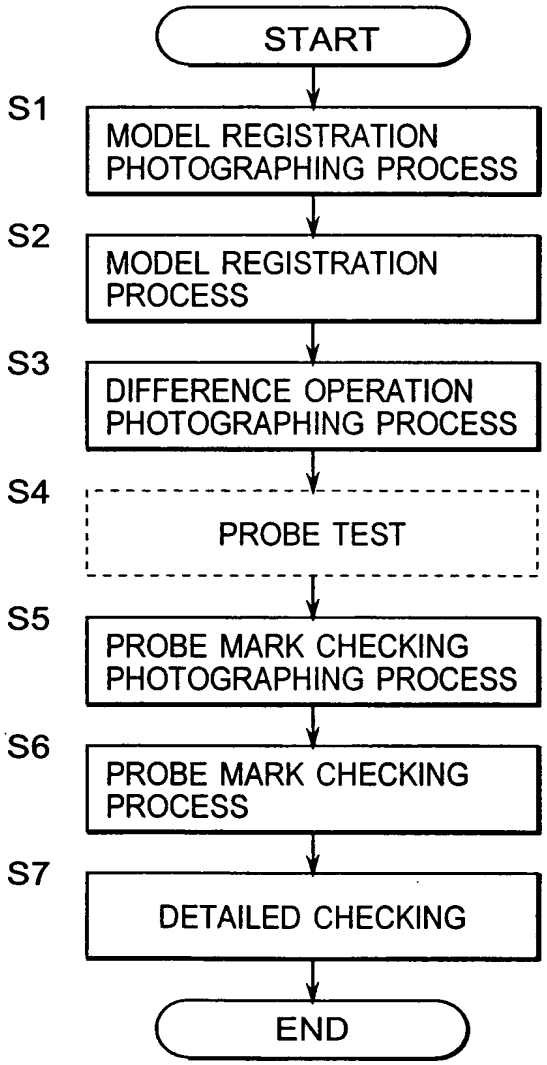
START
S1
MODEL REGISTRATION PHOTOGRAPHING PROCESS
S2
MODEL REGISTRATION PROCESS
S3
DIFFERENCE OPERATION PHOTOGRAPHING PROCESS
S4
PROBE TEST
S5
PROBE MARK CHECKING PHOTOGRAPHING PROCESS
S6
PROBE MARK CHECKING PROCESS
S7
DETAILED CHECKING
END

Fig. 12

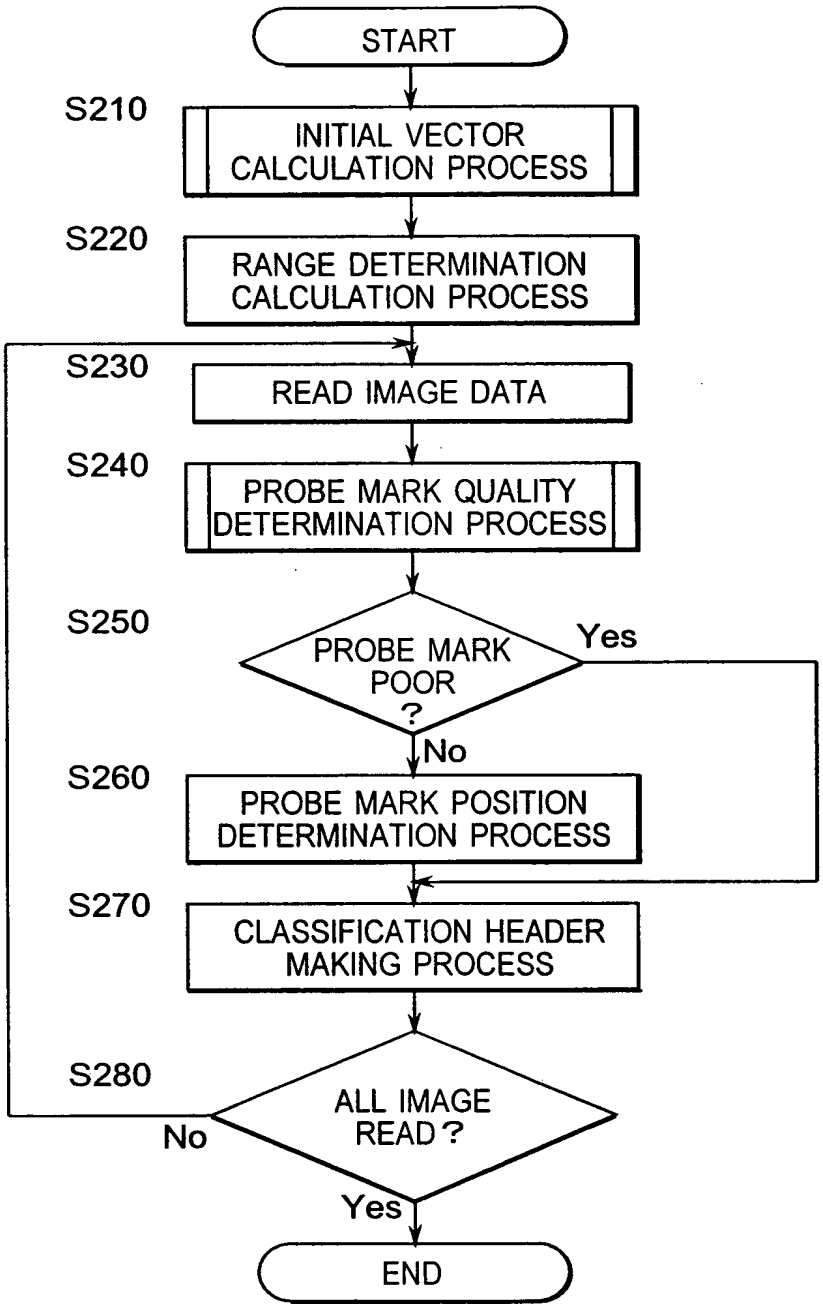
START
S210
INITIAL VECTOR CALCULATION PROCESS
S220
RANGE DETERMINATION CALCULATION PROCESS
S230
READ IMAGE DATA
S240
PROBE MARK QUALITY DETERMINATION PROCESS
S250
PROBE MARK POOR ?
Yes
No
S260
PROBE MARK POSITION DETERMINATION PROCESS
S270
CLASSIFICATION HEADER MAKING PROCESS
S280
ALL IMAGE READ ?
No
Yes
END

Fig. 13

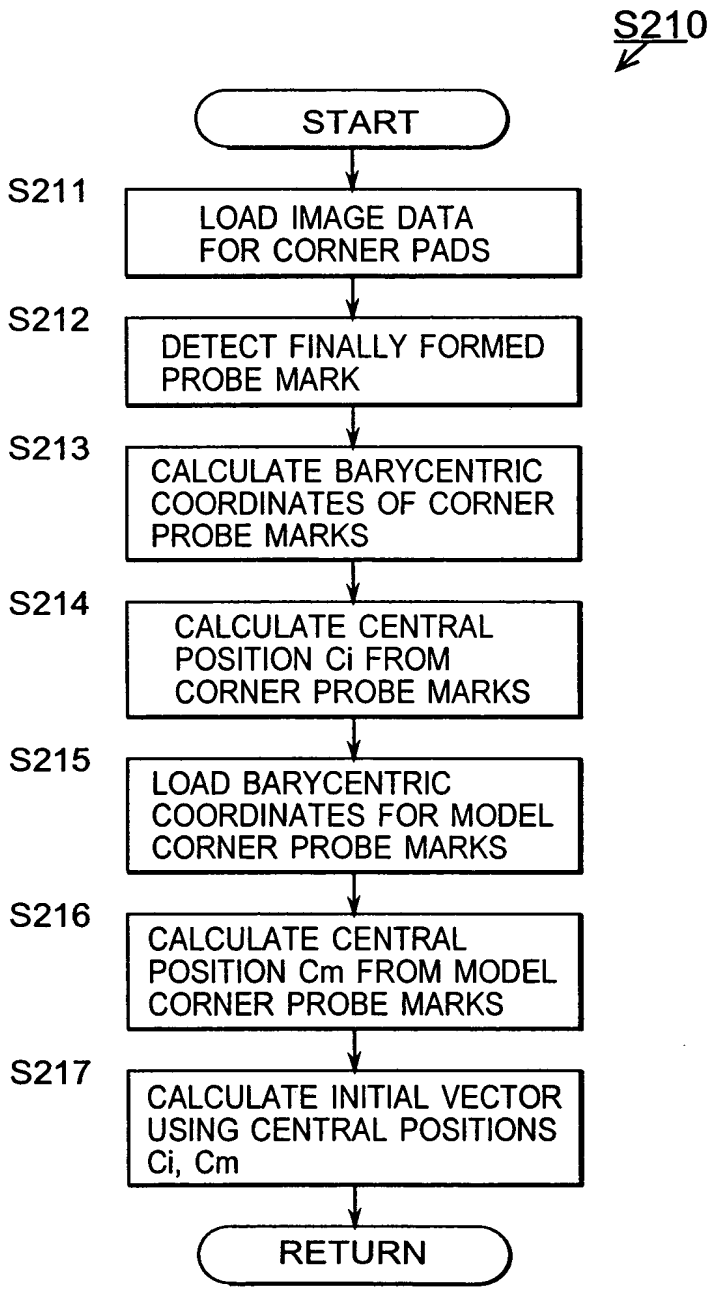
S210
START
S211
LOAD IMAGE DATA FOR CORNER PADS
S212
DETECT FINALLY FORMED PROBE MARK
S213
CALCULATE BARYCENTRIC COORDINATES OF CORNER PROBE MARKS
S214
CALCULATE CENTRAL POSITION Ci FROM CORNER PROBE MARKS
S215
LOAD BARYCENTRIC COORDINATES FOR MODEL CORNER PROBE MARKS
S216
CALCULATE CENTRAL POSITION Cm FROM MODEL CORNER PROBE MARKS
S217
CALCULATE INITIAL VECTOR USING CENTRAL POSITIONS Ci, Cm
RETURN

Fig. 14

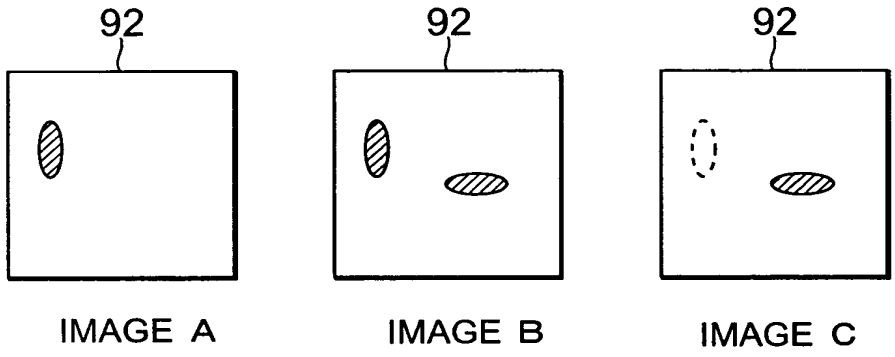
92
92
92
IMAGE A
IMAGE B
IMAGE C

Fig. 15

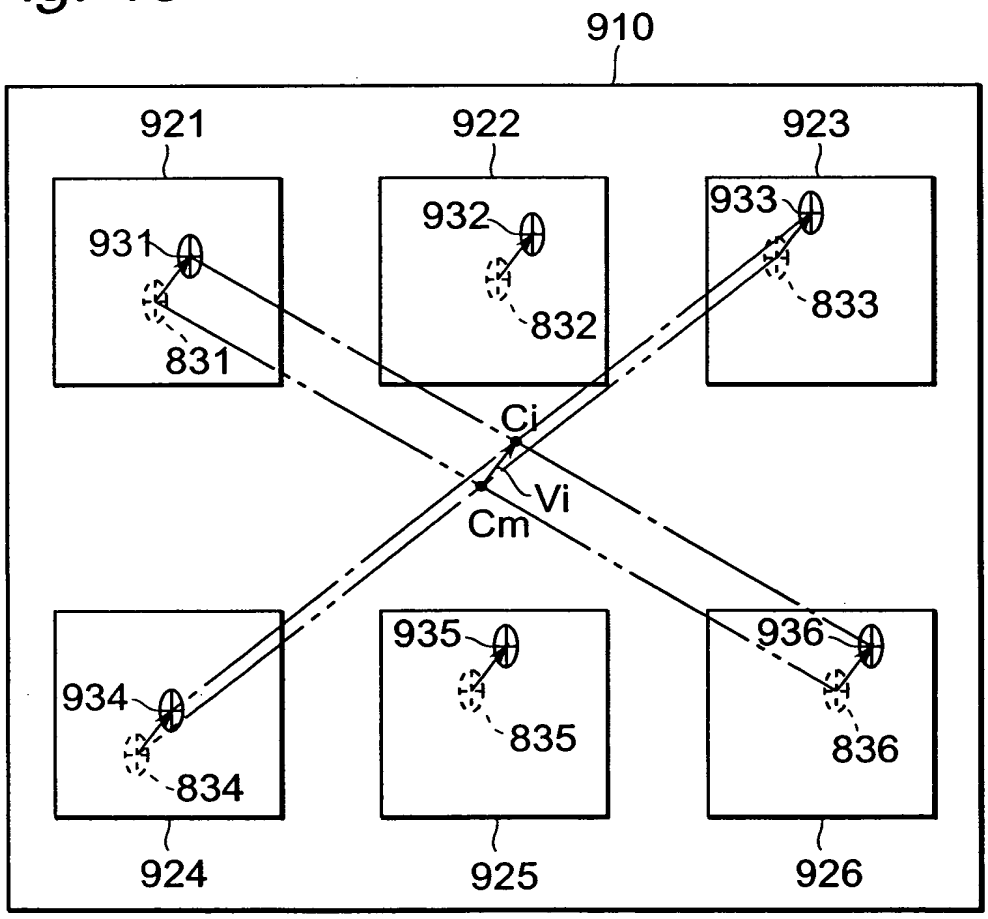
910
921
922
923
931
831
932
832
933
833
Ci
Vi
Cm
934
834
935
835
936
836
924
925
926

Fig. 16

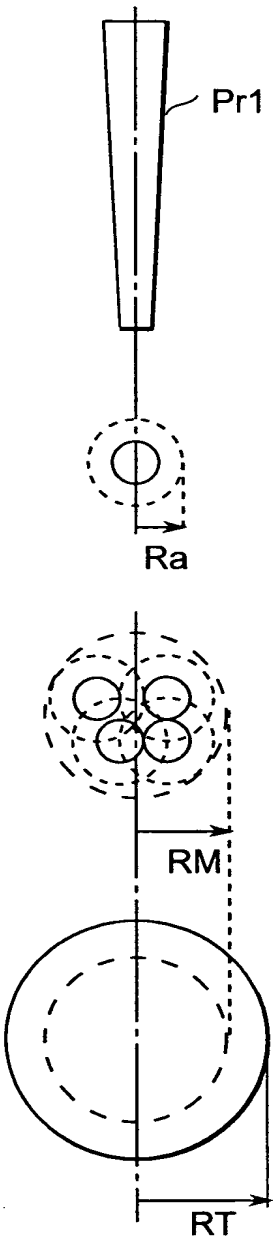

Fig. 17

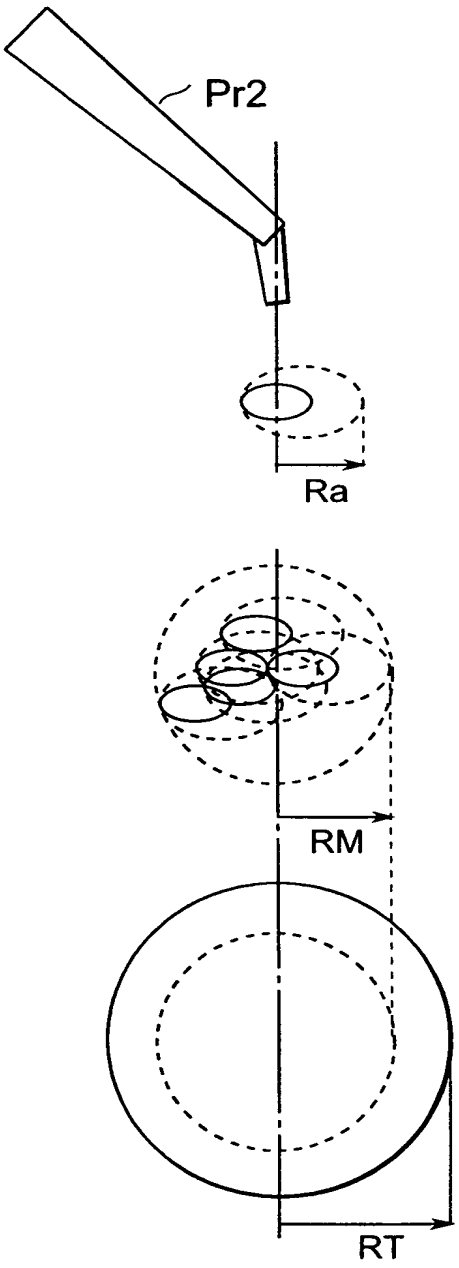

Fig. 18

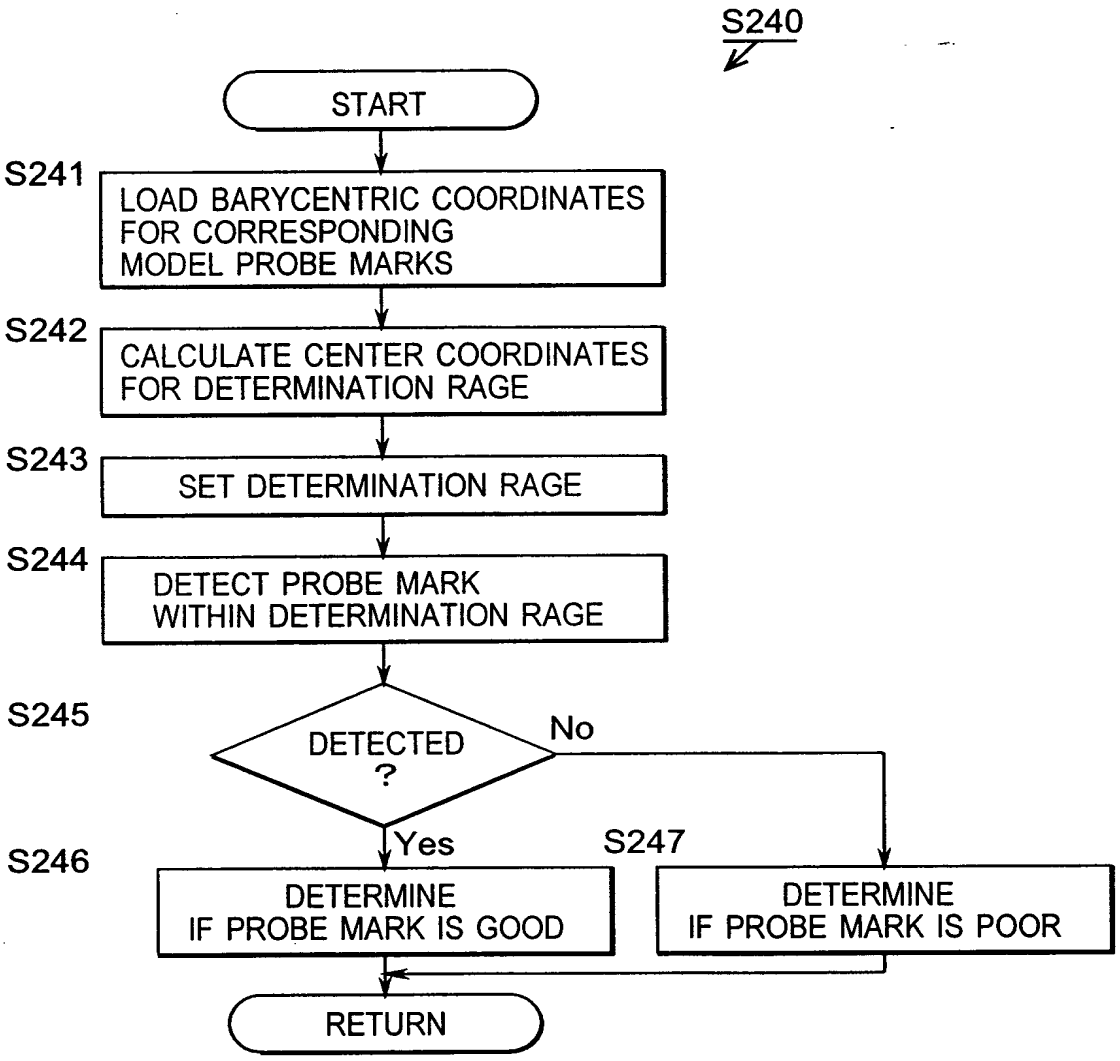
S240
START
S241
LOAD BARYCENTRIC COORDINATES FOR CORRESPONDING MODEL PROBE MARKS
S242
CALCULATE CENTER COORDINATES FOR DETERMINATION RAGE
S243
SET DETERMINATION RAGE
S244
DETECT PROBE MARK WITHIN DETERMINATION RAGE
S245
DETECTED ?
No
Yes
S246
DETERMINE IF PROBE MARK IS GOOD
S247
DETERMINE IF PROBE MARK IS POOR
RETURN

Fig. 19

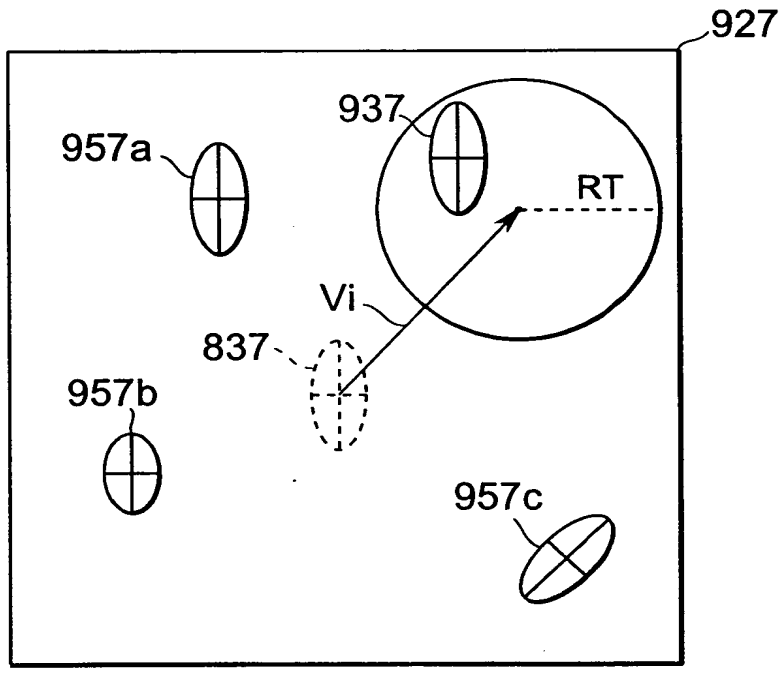

Fig. 20

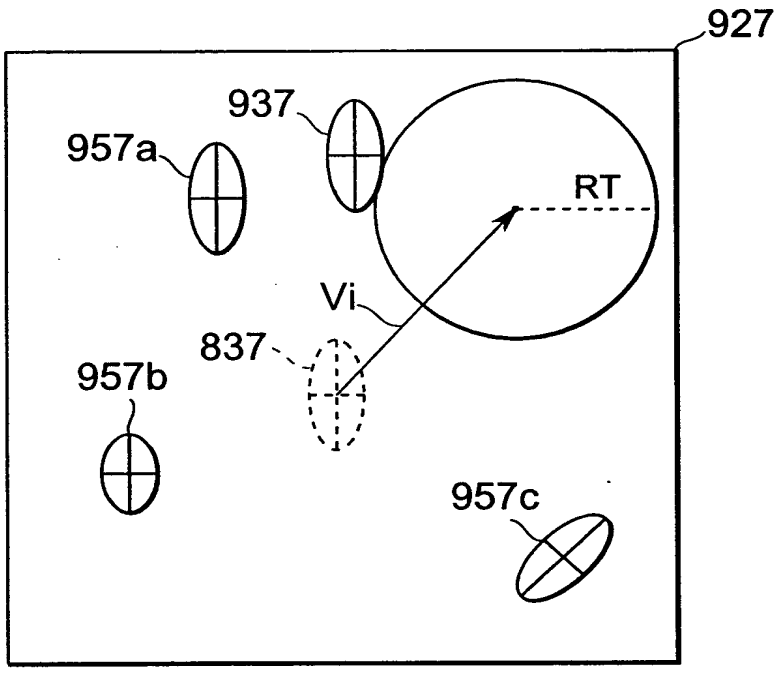

Fig. 21

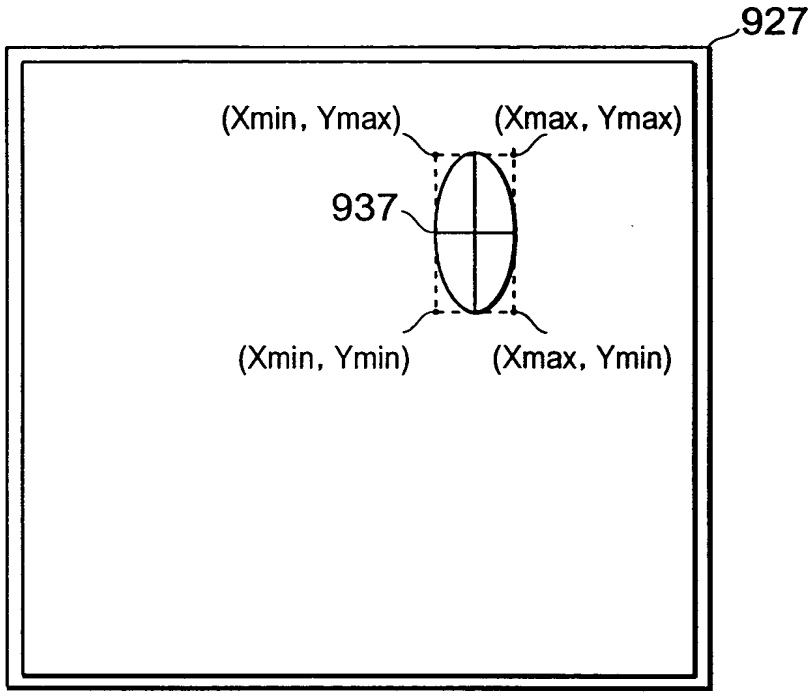
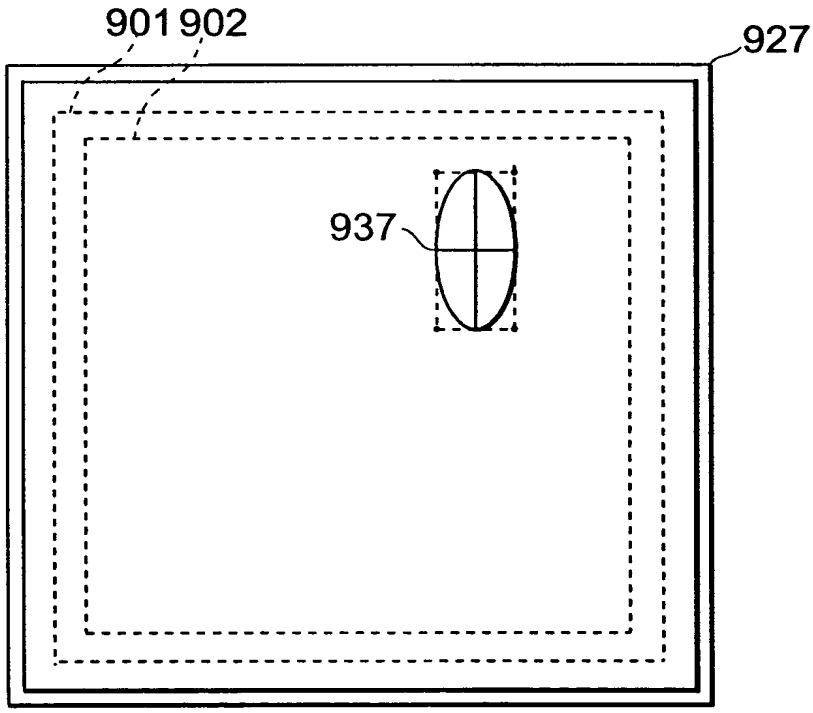
Fig. 22